WHAT IS CLAIMED IS:

1. An optical disk substrate film-formation apparatus which manufactures an optical disk by forming a thin film on the surface of a substrate, said apparatus comprising:

a substrate holder which fixes said substrate during the formation of said film,

wherein said substrate holder has a contact holding surface contacting at least a portion of a rear surface of a film-formed area of said substrate on which said film is formed.

2. The optical disk substrate film-formation apparatus according to claim 1, wherein said contact holding surface is made from a material with hardness lower than said substrate.

3. The optical disk substrate film-formation apparatus according to claim 1, wherein said substrate holder has a vacuum chuck section for adsorbing and fixing said contact holding surface to said substrate, and said contact holding surface has a groove section.

4. The optical disk substrate film-formation apparatus according to claim 1, wherein said substrate holder has a vacuum chuck section for adsorbing and fixing said contact holding surface to said substrate; and a removal claw for removing the adsorbed substrate.

5. The optical disk substrate film-formation apparatus according to claim 1, wherein said substrate holder is located between a film-formation chamber in which film formation for a substrate is performed and a substrate carriage chamber in which a pressure is maintained at a lower level than that in said film-formation chamber, and said contact holding surface has a through-hole communicated to said substrate carriage chamber and to said film-formation chamber.

6. An optical disk substrate film-formation apparatus which manufactures an optical disk by forming a thin film on the surface of a substrate, said apparatus comprising:

a substrate holder which fixes said substrate during the formation of said film,

wherein said substrate has a thickness of 0.6 mm or less, and said substrate holder has a contact holding surface contacting at least a portion of a rear surface of a film-formed area of said substrate on which said film is formed.

7. The optical disk substrate film-formation apparatus according to claim 6, wherein said contact holding surface is made from a material with hardness lower than said substrate.

8. The optical disk substrate film-formation apparatus according to claim 6, wherein said substrate holder has a vacuum chuck section for adsorbing and fixing said contact holding surface to said substrate, and said contact holding surface has a groove section.

9. The optical disk substrate film-formation apparatus according to claim 6, wherein said substrate holder has a vacuum chuck section for adsorbing and fixing said contact holding surface to said substrate; and a removal claw for removing the adsorbed substrate.

10. The optical disk substrate film-formation apparatus according to claim 6, wherein said substrate holder is located between a film-formation chamber in which film formation for a substrate is performed and a substrate carriage chamber in which a pressure is maintained at a lower level than that in said film-formation chamber, and said contact holding surface has a through-hole communicated to said substrate carriage chamber and to said film-formation chamber.

Sub A8

11. An optical disk substrate film-formation apparatus comprising:

a substrate holder which holds a substrate at its rear surface so that sputter film formation can be carried out on

the front surface of said substrate, said substrate holder having a substrate holding surface which comes in contact with said rear surface of said substrate,

wherein said substrate holding surface is rough at at least a portion.

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12. The optical disk substrate film-formation apparatus according to claim 11, wherein the surface roughness Rmax (maximum height) of said substrate holding surface is 10 μm or more and less than 500 μm.

13. The optical disk substrate film-formation apparatus according to claim 12, wherein lubrication is provided at at least a portion of said substrate holding surface, and the surface roughness Rmax at the portion where the lubrication is provided is 10 μm or more and 500 μm or less.

14. The optical disk substrate film-formation apparatus according to claim 12, wherein at least a portion of said substrate holding surface is made from a self-lubricating plastic material, and the surface roughness Rmax of the portion made from the self-lubricating plastic material is 10 μm or more and 500 μm or less.

15. An optical disk substrate film-formation apparatus comprising:

a substrate holder which holds thereon a substrate as an object for film formation,

said substrate holder having,

a groove section which extends from a portion where said substrate holder contacts said substrate when said substrate holder is holding said substrate to a portion where said substrate holder does not contact said substrate when said substrate holder is holding said substrate; and

a porous member which can allow air to pass through is provided in said groove section.

16. The optical disk substrate film-formation apparatus according to claim 15, wherein said porous member is made from a material with excellent thermal conductivity.

17. The optical disk substrate film-formation apparatus according to claim 15, wherein said porous member is made from a polymeric material or a material with a polymeric material laminated on the surface.

18. The optical disk substrate film-formation apparatus according to claim 15, wherein said porous member is made from an elastic material.

19. An optical disk substrate film-formation apparatus comprising:

a substrate holder which holds thereon a substrate as an object for film formation,

said substrate holder having,

a groove section in a portion where said substrate holder contacts said substrate when said substrate holder is holding said substrate,

a porous member which can allow air to pass through is provided in said groove section; and

a through-hole which connects said groove section to the portion where said substrate holder does not contact said substrate when said substrate holder is holding said substrate.

20. The optical disk substrate film-formation apparatus according to claim 19, wherein said porous member is made from a material with excellent thermal conductivity.

21. The optical disk substrate film-formation apparatus according to claim 19, wherein said porous member is made from a polymeric material or a material with a polymeric material laminated on the surface.

22. The optical disk substrate film-formation apparatus according to claim 19, wherein said porous member is made from an elastic material.

23. An optical disk substrate film-formation apparatus comprising:

a substrate holder which holds thereon an optical disk substrate as an object for film formation;

an inner mask which masks a specified area on the inner side of said optical disk; and

an outer mask which masks a specified area on the outer side of said optical disk;

wherein said inner mask and said outer mask being used for forming a thin-film on a surface of said optical disk substrate,

said substrate holder having,

a substrate holding section which contacts said optical disk substrate on the rear surface of said optical disk substrate but in the portion where the thin-film has been formed on the front surface,

wherein and said substrate holding section contacts said optical disk substrate in the portion extending between a line which is 2 to 10 mm on the outer side of the outer edge of said inner mask and a line which is 0.5 to 5 mm on the inner side of the inner edge of said outer mask.

24. The optical disk substrate film-formation apparatus according to claim 23, the thickness of said optical disk substrate is between 0.3 to 0.8 mm.

25. The optical disk substrate film-formation apparatus according to claim 23, wherein the edge of said substrate holding section is tapered.

26. The optical disk substrate film-formation apparatus according to claim 25, wherein a taper angle is the angle between the tapered surface obtained by tapering and the surface of said substrate holding section where said optical disk substrate contacts said surface holding section, and the taper angle is between 1.0 to 2.0 degree.

27. The optical disk substrate film-formation apparatus according to claim 23, wherein the edge of said substrate holding section is made from a material having a hardness lower than the hardness of said optical disk substrate.

28. The optical disk substrate film-formation apparatus according to claim 27, wherein the width of the portion made from the material having a lower hardness, in the radial direction of said optical disk, is between 0.1 to 0.5 mm.

29. The optical disk substrate film-formation apparatus according to claim 27, wherein said low hardness material is silicon rubber.

30. An optical disk substrate film-formation apparatus used for sputter film formation in which a laminated film is formed by combining any one or two or more of a reflection layer, a recording layer, a protection layer, or a dielectric body layer on a disk substrate in an optical disk manufacture step comprising:

a gas supply section for introduction of gas in the substrate holder side in a limited portion between a substrate setting surface of the substrate holder and a film-formed substrate, and at least a closed space section in the area formed in the substrate holder side because of contact between the substrate and substrate holder.

31. The optical disk substrate film-formation apparatus according to claim 30, wherein gas is supplied from the gas supply section during a period from a time point when sputter film formation is finished until a time point when a substrate is carried out.

32. The optical disk substrate film-formation apparatus according to claim 31, wherein the gas supplied from said gas supply section is also used as vent-gas for an intermediate chamber between atmosphere for inserting a substrate into or carrying out from the optical disk substrate film-formation apparatus and vacuum (described as load lock chamber).

33. The optical disk substrate film-formation apparatus according to claim 30, wherein a gas inlet port for introducing gas from outside of the optical disk substrate film-formation apparatus is provided in an internal wall of a frame of the optical disk substrate film-formation apparatus forming a closed space of the load lock chamber, a gas supply port communicating to gas supply section is provided in said substrate holder, and said gas inlet port of the frame of the optical disk substrate film-formation apparatus and said gas supply port of said substrate holder are communicated to each other only when said substrate holder moves to a specified position of the load lock chamber.

34. The optical disk substrate film-formation apparatus according to claim 33, wherein said gas inlet port of a frame of the optical disk substrate film-formation apparatus and said gas supply port of said substrate holder are connected to each other via a O ring.

35. The optical disk substrate film-formation apparatus according to claim 30 having a tapered structure on which a joint section of said gas inlet port of the frame of said optical disk substrate film-formation apparatus and that of said gas supply port of said substrate holder are positioned one above another.

36. The optical disk substrate film-formation apparatus according to claim 33 further comprising:

a bypass valve which communicates a gas inlet port of a frame of said optical disk substrate film-formation apparatus to a load lock chamber, said bypass valve being provided in a gas inlet path formed by jointing said gas inlet port of the frame of the optical disk substrate film-formation apparatus to said gas supply port of said substrate holder,

wherein said bypass valve is opened only when the lock load chamber is evacuated to a vacuum state.

37. The optical disk substrate film-formation apparatus according to claim 35 further comprising:

a bypass valve which communicates a gas inlet port of a frame of said optical disk substrate film-formation apparatus to a load lock chamber, said bypass valve being provided in a gas inlet path formed by jointing said gas inlet port of the frame of the optical disk substrate film-formation apparatus to said gas supply port of said substrate holder,

wherein said bypass valve is opened only when the lock load chamber is evacuated to a vacuum state.

38. The optical disk substrate film-formation apparatus according to claim 33 further comprising:

an evacuation path which can independently be evacuated to a vacuum state is provided in a gas inlet path of a frame of said optical disk substrate film-formation apparatus formed by jointing said gas inlet port of the optical disk substrate film-formation apparatus to said gas supply port of said substrate holder,

wherein evacuation to a vacuum state from the evacuation path is performed only when the load lock chamber is to be evacuated to a vacuum state.

39. The optical disk substrate film-formation apparatus according to claim 35 further comprising:

an evacuation path which can independently be evacuated to a vacuum state is provided in a gas inlet path of a frame of said optical disk substrate film-formation apparatus formed by jointing said gas inlet port of the optical disk substrate film-formation apparatus to said gas supply port of said substrate holder,

wherein evacuation to a vacuum state from the evacuation path is performed only when the load lock chamber is to be

evacuated to a vacuum state.

40. The optical disk substrate film-formation apparatus according to claim 30, wherein the edge of a substrate holder forming a border between a contact section in which a rear surface of the substrate and the substrate holder contact to each other when the substrate is loaded on said substrate holder and a non-contact section, or at least a hole edge section of said gas supply section is given a R processing.

41. The optical disk substrate film-formation apparatus according to claim 30, wherein a surface of said substrate holder is lubricated.

42. The optical disk substrate film-formation apparatus according to claim 41, wherein the water-repelling processing such as complex plating with water-repelling powder such as carbon fluoride (Cf)n or fluororesin (PTFE, PFE, FEP), or processing with a chlorosilane-based chemical adsorbent having a fluoroalkyl base is executed as the processing for lubrication.

43. An optical disk substrate film-formation apparatus used for sputter film formation in which a laminated film is formed by combining any one or two or more of a reflection layer, a

recording layer, a protection layer, or a dielectric body layer on a disk substrate, wherein at least one groove section extending once around a center of a section where a disk is placed and having a construction in which an angle between "a tangent to a rim of said groove at any position" and "a tangent to a circle around a center of a section where said disk substrate is placed at the same position" is not more than 30 degrees is provided in an area of a surface of a substrate holder opposing to a firm-formed area of the disk substrate, and a portion other than said groove section closely contact and supports a rear surface of the film-formed area of said disk substrate.

44. The optical disk substrate film-formation apparatus according to claim 43, wherein the rim of said groove section is a concentric circle around a center of the section where said disk substrate is placed.

45. The optical disk substrate film-formation apparatus according to claim 43, wherein a taper is provided in the edge forming the rim of said groove section.

46. The optical disk substrate film-formation apparatus according to claim 43, wherein the edge forming the rim of said groove section is given a R processing.

47. The optical disk substrate film-formation apparatus according to claim 43, wherein at least a surface of the substrate holder contacting said disk substrate is lubricated.

48. The optical disk substrate film-formation apparatus according to claim 47, wherein the water-repelling processing such as complex plating with water-repelling powder such as carbon fluoride (Cf)n or fluororesin (PTFE, PFE, FEP), or processing with a chlorosilane-based chemical adsorbent having a fluoroalkyl base is executed as the processing for lubrication.

49. The optical disk substrate film-formation apparatus according claims 43, wherein at least a surface of the substrate holder which contacts said disk substrate is made from a material such as PTFE or polyacetal having a lubricating capability.

50. The optical disk substrate film-formation apparatus according to claim 43, wherein a flow path extending from a section of said substrate holder other than the section where a disk substrate is placed, said section vacuum-evacuated and ventilated when said disk substrate is carried into or out from the optical disk substrate film-formation apparatus up to inside of said groove section is formed.

51. An optical disk substrate film-formation method of manufacturing an optical disk by forming a thin-film on a substrate fixed on a substrate holder, wherein said substrate holder holds said substrate, when fixing the substrate, by closely contacting at least a portion of a surface where the substrate is placed thereon to a portion of a rear surface of a film-formed area of the substrate in which a thin-film is formed.

52. An optical disk substrate film-formation method of manufacturing an optical disk by forming a thin-film on a substrate fixed on a substrate holder, wherein said substrate holder holds, when a substrate having a thickness of 0.6 mm or less is fixed, the substrate by closely contacting at least a portion of a surface on which the substrate is fixed to at least a portion of a rear surface of a film-formed area of the substrate where a film is formed therein.

53. The optical disk substrate film-formation method according to claim 52, wherein said film-formation step further includes a rear surface protection film formation step in which a protection film for protecting a rear surface of a substrate closely contacting said substrate holder is formed on the rear surface.

54. The optical disk substrate film-formation method according to claim 53, wherein the protection film is formed by spin-coating YV hardening resin which is resin hardened when a ultraviolet ray is irradiated thereto in said read surface protection film formation step.

55. The optical disk substrate film-formation method according to claim 53, wherein the protection film is formed by sputtering in said rear surface protection film formation step.

56. The optical disk substrate film-formation method according to claim 55, wherein said protection film formed by sputtering is a laminated film comprising one or more of a silicon nitride film a silicon oxide film, a titanium nitride film, and a film made from a composition of indium, titanium, and oxygen.

57. An optical disk film-formation method carried out in an optical disk substrate film-formation apparatus having a film-formation chamber in which a film is formed on a substrate, a substrate carriage chamber from which a substrate is carried to said film-formation chamber, and a substrate holder having a through-hole provided between said substrate carriage chamber and film-formation chamber and connected to said substrate

carriage chamber and film-formation chamber, said optical disk film-formation method comprising:

a film-formation step in which a substrate is fixed on said substrate holder and a film is formed on the substrate by maintaining a pressure in said film-formation chamber higher than that in said film carriage chamber.

58. The optical disk substrate film-formation method according to claim 57, wherein at least a portion of a rear surface of a film-formed area of a substrate in which a film is formed thereon is closely contacted to said substrate holder in said film-formation step.

59. The optical disk substrate film-formation method according to claim 57, wherein said film-formation step further includes a rear surface protection film formation step in which a protection film for protecting a rear surface of a substrate closely contacting said substrate holder is formed on the rear surface.

60. The optical disk substrate film-formation method according to claim 59, wherein the protection film is formed by spin-coating YV hardening resin which is resin hardened when a ultraviolet ray is irradiated thereto in said read surface protection film formation step.

61. The optical disk substrate film-formation method according to claim 59, wherein the protection film is formed by sputtering in said rear surface protection film formation step.

62. The optical disk substrate film-formation method according to claim 61, wherein said protection film formed by sputtering is a laminated film comprising one or more of a silicon nitride film a silicon oxide film, a titanium nitride film, and a film made from a composition of indium, titanium, and oxygen.

63. An optical disk film-formation method carried out in an optical disk substrate film-formation apparatus having a film-formation chamber in which a film is formed on a substrate, a substrate carriage chamber from which a substrate is carried to said film-formation chamber, and a substrate holder having a through-hole provided between said substrate carriage chamber and film-formation chamber and communicating to said substrate carriage chamber and film-formation chamber, said optical disk film-formation method comprising:

a film-formation step in which, when a substrate having a thickness of 0.6 mm or less is fixed, the substrate is fixed by said substrate holder and a film is formed thereon by maintaining a pressure in said film-formation chamber higher

than that in said substrate carriage chamber.

64. The optical disk substrate film-formation method according to claim 63, wherein at least a portion of a rear surface of a film-formed area of a substrate in which a film is formed thereon is closely contacted to said substrate holder in said film-formation step.

65. The optical disk substrate film-formation method according to claim 63, wherein said film-formation step further includes a rear surface protection film formation step in which a protection film for protecting a rear surface of a substrate closely contacting said substrate holder is formed on the rear surface.

66. The optical disk substrate film-formation method according to claim 65, wherein the protection film is formed by spin-coating YV hardening resin which is resin hardened when a ultraviolet ray is irradiated thereto in said read surface protection film formation step.

67. The optical disk substrate film-formation method according to claim 65, wherein the protection film is formed by sputtering in said rear surface protection film formation step.

68. The optical disk substrate film-formation method according to claim 67, wherein said protection film formed by sputtering is a laminated film comprising one or more of a silicon nitride film a silicon oxide film, a titanium nitride film, and a film made from a composition of indium, titanium, and oxygen.

69. An optical disk substrate film-formation method of forming a film by sputtering on a surface of a substrate by closely contacting a rear surface of a substrate to a substrate holder to hold an optical disk substrate with said substrate holder,

said method using an optical disk substrate film-formation apparatus comprising:

a substrate holder which holds a substrate at its rear surface so that sputter film formation can be carried out on the front surface of said substrate, said substrate holder having a substrate holding surface which comes in contact with said rear surface of said substrate,

wherein said substrate holding surface is rough at at least a portion.

70. A substrate manufacture method comprising:

a step of forming a substrate holder which holds a substrate at its rear surface so that sputter film formation

can be carried out on the front surface of said substrate, said substrate holder having a substrate holding surface which comes in contact with said rear surface of said substrate;

a step of making at least a portion of said substrate holding surface contacting a rear surface of said substrate rough; and

a step of lubricating said rough surface by means of complex plating with fine powder of carbon fluoride (CF)n or fluororesin to make the surface roughness Rmax of the lubricated section to 10 μm or more and 500 μm or less.

71. A substrate manufacture method comprising:

a step of forming a substrate holder which holds a substrate at its rear surface so that sputter film formation can be carried out on the front surface of said substrate, said substrate holder having a substrate holding surface which comes in contact with said rear surface of said substrate;

a step of making at least a portion of said substrate holding surface contacting a rear surface of said substrate rough; and

a step of lubricating said rough surface with a chlorosilane-based chemical adsorbent to make the surface roughness Rmax of the lubricated section to 10 μm or more and 500 μm or less.

72. A substrate holder manufacture method comprising:

a step of forming a substrate holder which holds a substrate at its rear surface so that sputter film formation can be carried out on the front surface of said substrate, said substrate holder having a substrate holding surface which comes in contact with said rear surface of said substrate;

a step of making at least a portion of said substrate holding surface contacting a rear surface of said substrate rough; and

a step of lubricating said rough surface by means of organic plating with triazinethiol to make the surface roughness Rmax of the lubricated section to 10 μm or more and 500 μm or less.

73. A substrate holder which holds thereon a substrate as an object for film formation in an optical disk substrate film-formation apparatus, said substrate holder comprising:

a groove section which extends from a portion where said substrate holder contacts said substrate when said substrate holder is holding said substrate to a portion where said substrate holder does not contact said substrate when said substrate holder is holding said substrate; and

a porous member which can allow air to pass through is provided in said groove section.

74. The optical disk manufactured with an optical disk substrate film-formation apparatus; said optical disk substrate film-formation apparatus used for sputter film formation in which a laminated film is formed by combining any one or two or more of a reflection layer, a recording layer, a protection layer, or a dielectric body layer on a disk substrate, wherein at least one groove section extending once around a center of a section where a disk is placed and having a construction in which an angle between "a tangent to a rim of said groove at any position" and "a tangent to a circle around a center of a section where said disk substrate is placed at the same position" is not more than 30 degrees is provided in an area of a surface of a substrate holder opposing to a firm-formed area of the disk substrate, and a portion other than said groove section closely contact and supports a rear surface of the film-formed area of said disk substrate.

75. A phase-change type of optical disk comprising a lower dielectric body protection layer made from a mixture of zinc sulfide and silicon oxide provided on a substrate, a phase-change recording layer, an upper dielectric body protection layer made from a mixture of zinc sulfide and silicon oxide, and a reflection/heat-emission layer as constituent layers, wherein a main component of the reflection/heat-emission layer is Ag and a sulfidization-preventing conductive layer is

provided between the upper dielectric body protection layer and the reflection/heat-emission layer.

76. A phase-change recording type of optical disk according to claim 75, wherein a thickness of said sulfidization-preventing conductive layer is smaller than that of the reflection/heat-emission layer.

77. A phase-change recording type of optical disk according to claim 75, wherein said sulfidization-preventing conductive layer is a film made from an Al-containing alloy such as $Alcu_x$, $AlSi_x$, $AiSi_xCu_y$, $AlSc_x$, or $AlSi_xTi_y$.

78. A phase-change recording type of optical disk according to claim 75, wherein the sulfidization-preventing conductive layer is a high melting-point metallic film comprising a Ti film, a Zr film, or an Hf film, or a film made from a high melting-point metal alloy such as Ti_xN_y, Ti_xSi_y, Zr_xN_y, Zr_xSi_y, Hf_x, N_y, or Hf_xSi_y.

79. A phase-change recording type of optical disk according to claim 75, wherein said sulfidization-preventing conductive layer is a film made from a Ta-containing alloy such as Ta_xN_y, or $TaSi_y$.

80. A phase-change recording type of optical disk according to claim 75, wherein said sulfidization-preventing conductive layer is W film or a film made form a W-containing alloy such as W_xN_y or W_xSi_y.